REMARKS

The filing of this RCE application was accompanied with a submission comprising an Amendment Under Rule 1.116 which was not previously entered. Although the amendment was not entered, the Examiner did include in the Advisory Action extensive comments regarding the prior art teachings. Independent claims 1 and 5 have been further amended herein to correct deficiencies noted by the Examiner and to better distinguish over the prior art. Further, the dependent claims have been amended to better conform them with US practice and idiomatic English.

Herein, applicants' also present arguments specifically responding to those conclusions reached by the Examiner in supporting the claim rejections. Upon further review, it is believed that the Examiner will concur in the failure of the prior art teachings to meet the present invention as now set forth in the claims.

The rejections of claims 1 and 4 under 35 USC 103(a) as unpatentable over Yoder (5,225,366) in view of Dreifus et al. (5,420,443) is in error and, in any event, overcome by amendment. As set forth in claim 1, the layer of diamond-type carbon is formed by transformation of the carbon hybridization on the last atomic layer of the SiC substrate. In this manner, the transformation enables "the layer of diamond-type carbon thereby extending over substantially the entire area of said

substrate" as set forth in claim 1. The achievement of such coextensive areas is advantageous in industrial applications as discussed at page 10, lines 25-28 of the present specification.

There is no suggestion in Yoder or Dreifus of a monoatomic and monocrystalline layer of diamond-type carbon having a sp^3 configuration. Dreifus teaches a 3D germination (a Wolmer-Weber type 3D germination) on a SiC substrate, with a high crystal density which makes it possible to obtain a coalescence of the crystals and then the formation of a film via appropriate growth conditions. Accordingly, the prior art teachings relate to nucleation and growth, not phenomenon of the invention based upon the transformation of the carbon hybridization on the last atomic layer of a specially prepared SiC substrate.

Applicants have previously urged that Yoder does not teach a monoatomic layer. In this regard, the Examiner notes that Yoder teaches an atomic layer epitaxy of a diamond film and that by definition, Yoder would form a monoatomic layer during the first cycle of forming a thicker layer. This is not a practical teaching useful to one skilled in the art to render obvious the present invention. This is true since an exposure of 25×10^{-6} second would be necessary in order to obtain a monolayer, as mentioned in the abstract and column 12, lines 66-68 of Yoder. Such a value of 25×10^{-6} second is not only

theoretical (it is not supported by an example in practice), but also technically deficient as a teaching because it is impossible to cause a reactive gas to contact a substrate only during such a short amount of time. It is therefore submitted that the prior art has not disclosed and the Examiner has not cited a teaching of a monolayer sufficient to meet the claim limitations.

As urged in prior amendments, the combination of Yoder with Dreifus et al. does not suggest a monoatomic and monocrystalline layer of diamond-type carbon formed on SiC. Dreifus et al. disclose a process in which the lattice constant difference between the deposited material and the substrate used has an order of magnitude which is close to the difference which is disclosed in connection with the present invention, namely 22%. This is true because Dreifus et al. use TiC (lattice constant: 0.4329 nm) as the intermediate layer 23, so that the lattice constant difference with respect to diamond is theoretically on the order of 21%. The word "theoretically" is used because there is a fundamental difference between the present invention and Dreifus et al. which precludes such an interpretation. Namely, Dreifus et al. material cannot consist of a diamond monoatomic and monocrystalline layer because the process used is a Wolmer-Weber type 3D germination. The use of this process yields a highly oriented structure (see Dreifus et al. column 11, line 25: "highly oriented

texture diamond layer 25"). In fact, Dreifus et al. admit that they do not obtain monocrystalline diamond. In the patentee's opinion, the properties of the material come close to the properties of monocrystalline diamond (column 11, line 28), and the patentee thereby implicitly admits that his material and monocrystalline diamond are different from each other. Under no circumstances do Dreifus et al. obtain a monocrystalline structure of diamond that contemplates a crystal which is precisely defined by structural features, namely a crystalline structure (two interpenetrated face-centered-cubic lattices) and a lattice constant (0.3567 nm).

For the foregoing reasons, it is respectfully submitted that neither Yoder nor Dreifus et al. alone, or in combination, disclose a process which makes it possible to obtain a monoatomic and monocrystalline layer of diamond. In this regard, it is again emphasized for the Examiner's consideration that a monoatomic layer of a material and a bulk substrate of the same material have fundamentally different properties. The resistivity of the monolayer is greater than the resistivity of a bulk substrate of the same material, and the mean free path of the conduction electrons of the monolayer is lower than the mean free path of the conduction electrons of the bulk substrate. Further, the temperature coefficient is an increasing function of thickness, and attends to

approach the temperature coefficient of a bulk substrate when the thickness becomes large.

The prior rejection of claims 1, 4 - 6 and 8 - 11 under 35 USC 103(a) as unpatentable over Powers et al. in view of Liu et al. (5,516,500) is in error and, in any event, overcome by amendment. Claims 1 and 11 have each been amended to exclude the use of "alternate heating and cooling of said substrate by intermittently passing an electric current therethrough for less than a second." As discussed below, the heating and cooling are necessary features of the Liu et al. teaching and exclusion of the same from the claims distinguishes the present invention. As previously urged to the Examiner, it is again noted that the Powers et al. document is referenced at page 7 of the present application. Powers et al. relate to a c(2 x 2) surface of SiC (100) which is terminated by a plane of sp type carbon (acetylene), and not a plane of sp^3 type carbon (diamond) as in the present application.

In the Advisory Action, the Examiner urges that the references not be attacked separately. Applicants' agree with the Examiner's position, but emphasize herein that it is clear that the technology used does not make it possible to control matter at the atomic scale, because of the simplicity of the means used in this process (heating of a material containing carbon, which has not been previously structured at the atomic level), so that the carbon has no determined crystalline structure.

Further, such a technology does not make it possible to obtain a diamond (which has a well-defined crystalline structure) regardless of the substrate used for the process. (That is, the Powers et al. substrate or any other substrate).

With particular regard to the Examiner's comments at page 3 of the Advisory Action, the independent claims have been amended to specifically distinguish Liu et al. by exclusion of "the alternate heating and cooling of the substrate by intermittently passing an electric current therethrough for less than a second." Liu et al. teaches in column 2, lines 10 - 27 that rapid-heating of the carbon containing material is achieved by disposing it between electrode plates. The current is applied for only a short time interval, less than a second, and it is sufficient to cause heating of the substrate of at least about 5,000° C/sec. After the current is removed from the electrodes, the substrate is subjected to rapid-quenching (cooling). This is achieved by means of contact with a heat sink.

Accordingly, applicants' disagree with the Examiner's conclusion that the Powers et al. material and the Liu et al. process are similar to the present material and process. As noted above, the present invention does not comprise a cooling step, such step being essential for Liu et al. Further, another essential step of the Liu et al. process is not found in

the present invention, namely, making a current pass through the initial substrate which contains carbon is precluded by the amended claims herein. Accordingly, two essential steps of the Liu et al. process are not found in the present invention and the present invention cannot be considered to be a process which is similar to Liu et al.

In this connection it is again urged that the material which is obtained by means of the Liu et al. process is not monocrystalline and it is polluted.

For all of the foregoing reasons, it is respectfully submitted that all of the claims presently of record are in condition for allowance and such action is requested.

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Respectfully submitted,

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